United States Patent [19]

Moore

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[54] **COMPREHENSIVE ENGINE MONITOR AND RECORDER**

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Related U.S. Application Data

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[51] Int. Cl.⁴ **G11B 5/02; G01M 15/00**
[52] U.S. Cl. **364/551.01; 364/550; 364/442; 364/507; 340/945; 340/959; 73/117.4; 360/5**
[58] **Field of Search** 364/442, 550, 551, 507; 340/945, 959, 963; 73/117.4; 360/5

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[57] **ABSTRACT**

A comprehensive turbine engine monitoring and recording system includes an electronics unit which may be engine mounted, and which contains at least a non-volatile memory and a data-processor, for use with a remote unit suitable for either cockpit mounting or for accessing by a ground portable unit which may include an additional data-processor and display and/or printer units. Raw input data is supplied to the electronics unit, and this input information may include engine and outside air temperature, torque, engine speed, vibration, altitude and airspeed data, for examples. Exceedance data relative to the operation of the aircraft above pre-defined limits of temperature, torque and speed are recorded, with the details of each exceedance being permanently stored. In addition, over-limits levels are segregated and the total time during which the engine is operated within each of the over-limits bands is measured, and is recorded in a non-volatile, electronically alterable memory which is periodically updated during operation of the aircraft. The number of starts, and power cycles are also counted and stored, and the total running time of the engine is also recorded. Upon command from the remote unit, information is transferred from the non-volatile memory to any of a number of remote data storage, or data processing units, which may include printer and/or display units, so that the time at which the turbine has been operated at specific over-temperature levels, and other important operating data may be readily accessed. Data required for engine trend monitoring is also automatically recorded so that long term plots and interpretation of engine degradation may be accomplished.

29 Claims, 20 Drawing Sheets

TREND MONITORING